Submitted by
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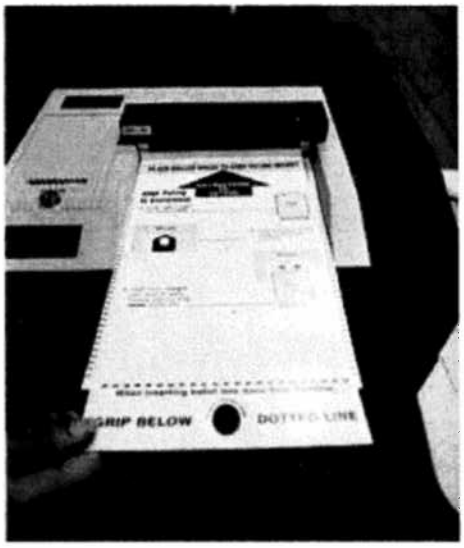
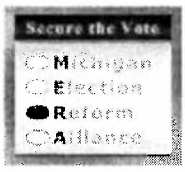
Are Michigan Elections Trustworthy?

A Citizen Audit of Two Elections in Allegan County



Michigan Election Reform Alliance.Org



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Executive Summary

In collaboration with the West Michigan News Co., the Michigan Election Reform Alliance.Org conducted a citizen audit in Allegan County of the vote count in the 2008 general and 2012 Republican primary. Motivated by a failed recount of a local '08 judicial race, the audit used the Freedom of Information Act to seek permission to photograph ballots from the two elections. Cooperation was obtained after the Michigan Attorney General issued an opinion that voted ballots are public records.

The audit looked for large discrepancies between hand counts and official vote totals that could indicate vote rigging and also used hand-count data to gauge tabulator error rates.

Appropriate practices for photographing ballot sets were developed. Limitations of volunteer time and numbers lead to a method of recording initial hand counts on spreadsheets and then correcting audit errors systematically, using photo numbers to identify ballots.

The audit found egregious failures to preserve ballot sets intact and many other election integrity weaknesses. However, no discrepancies of vote totals were found that were large enough to warrant allegations of tampering.

Data on 17 precincts from the '08 general and 11 from the '12 primary show average error rates of 0.26% and 0.42%. Single race error rates from the '08 general ranged from 0.0% to 1.08%. In the '12 primary, the single race range was from 0.0% to 1.78%.

The data indicate a critical need for manual recounts in close local races with small vote totals. The recount practice of running the ballots through the same tabulators again clearly does not provide a meaningful check on the correctness of close tabulated outcomes.

The high tabulator error rate, together with the various anomalies and election integrity failings detailed in the report, raise a very serious question: Should the current system of vote counting be replaced, perhaps by the time-tested practice of hand counting the vote on election night?

Introduction

As U.S. citizens, we like to think our elections are beyond reproach. After all, we're the oldest democracy in existence, the model -- we think -- for other nations. But in recent years more and more cracks in our systems of voting have appeared to the public eye, with consequences, for example in the presidential elections of 2000 and 2004,[1] that have deeply affected both our domestic economy and foreign policy. So, it's high time to ask how sound our elections are. Are they sufficiently transparent that we can know the outcomes are not manipulated? Are the votes counted accurately? Are the ballots secure?

After the general election in November of 2008, one very close circuit court judge race in Allegan County was challenged and a recount called for. When the recount was attempted, over half the precincts involved presented ballot containers with broken seals. Since the seals were broken, the local recount board could not be certain that the ballot sets were intact and unaltered, and the recount had to be dropped. The State Board of Canvassers refused to investigate further.

The failed recount prompted a group of Michigan citizens to conduct their own audit of the vote in Allegan County under the auspices of the West Michigan News Co. (WMNC). Their initial and extensive efforts were later brought to completion by the Michigan Election Reform Alliance (MERA). This report details the combined results of both efforts.

Purpose

The initial aim of the audit was to examine more closely the vote count in the 2008 general election. With ballot security already in question, a hand count of some races might turn up discrepant vote totals large enough to suggest vote tampering. In addition, the Republican primary in 2012 was also included in the audit since some residents of the county felt some established officials had strong motives to rig one particular county race.

A second aim emerged from consideration of the aging tabulators Michigan uses to count votes. These machines have been widely observed to breakdown during elections, sometimes forcing election workers to work into the wee hours on election night to overcome tabulation problems. But to our knowledge, no systematic data on the accuracy of Michigan's tabulators have ever been gathered.[2] Auditing the vote count in the two Allegan elections provided an excellent opportunity to gauge how well Michigan's tabulators count votes. Accordingly, the second aim was to determine how accurate the tabulators actually are.

To accomplish either purpose of the audit, it's necessary to determine as well whether the

ballot sets presented to the audit were the same size as reported in the poll books or the official report of election results. The question is crucial. If the ballot sets examined by the audit vary significantly in size from official ballot totals, then significant vote total discrepancies found by the audit can be attributed to the simple fact that the audit is counting a different set of ballots. In such cases large discrepancies in vote totals would not support an allegation of vote tampering.

For a vote total discrepancy, say of ten votes, to be a significant indicator of tampering, the size of the ballot set examined by the audit would have to be within a few ballots of the official ballot total. Moreover, one would need to rule out that the size of the vote discrepancy could be attributed to tabulator error. And for that, one would need to know the expected range and average rate of tabulator error. It turns out then that assessing evidence of vote tampering depends on knowing the tabulator error rates.

Background

The audit's method was to sample precincts in each election and count certain races by hand. However, according to the Bureau of Elections, Michigan law allows only sworn election workers to touch or even view (and photograph) ballots at the canvass of votes on election night. One cannot simply show up at a jurisdiction on election night and start conducting hand counts. Instead, the citizen audit began after the election was certified, and the ballots were released into the federal retention period.

Under Michigan's Freedom of Information Act (FOIA), the WMNC served most of the 52 jurisdictions in the county with requests to view and photograph the ballots from the 2008 election. With only one exception, however, Allegan's local clerks initially refused the FOIA request.

After the failure of numerous local appeals, one resistant jurisdiction requested an Attorney General opinion through their state senator. In May of 2010 the Michigan Attorney General's Office rendered an opinion that Michigan's FOIA mandates public access to the ballots for viewing and photographing *after an election has been certified*. "Voted ballots, which are not traceable to the individual voter, are public records subject to disclosure under the Freedom of Information Act, MCL 15.231 *et seq*."[3] Because WMNC's FOIA requests were outstanding, the Federal retention period was automatically extended to allow time for compliance with the outstanding requests.

After the Attorney General issued the opinion, a letter from a local law firm citing the opinion was sufficient to change the minds of local clerks. The WMNC subsequently arranged to

photograph ballot sets from the '08 general election in 31 Allegan County precincts.

The same approach was used in auditing the 2012 Republican primary. In all, 12 precincts were photographed, some by WMNC and some by MERA. Resistance from local clerks continued to be encountered, partially accounting for the smaller sample from the 2012 primary.

Ballot Photography

Photographing ballot sets for the audit's purposes required the development of appropriate practices to ensure clear and complete ballot images, to take shots of both fronts and backs in the primary election, and to identify photos.

Today's high-resolution digital cameras proved to be quite adequate for shooting ballots. With good lighting, images taken were typically readable without magnification. Read with a computer-based photo viewer, questionable votes could be resolved usually by zooming in on parts of the ballot. Various exigencies, however, can affect image quality.

Obviously, being sure the entire ballot side was in the shot was important. Also important was whether the ballot or the camera was moving. Motion blurring in the original image can not be overcome with magnification (zooming in). Occasionally, attempts to speed up the process of shooting hundreds of ballots in a short time lead to photos of ballots partially bent or partially obscured by the worker's hand. When volunteer photographers noticed or suspected such outcomes, they were asked to take a second shot of the ballot. When duplicates were taken, one of the shots had to be removed from the photo set later to ensure the integrity of the audit's photo set.

In one case maintaining integrity of the audit's photo set was complicated when a precinct worker included spoiled ballots in the set presented at the precinct. Photographers needed to be alert to such irregularities to ensure proper labeling and identification.

For the 2008 election, the audit first settled on a practice of shooting ballot fronts and backs as separate sets. Later the auditors decided to count just five sections of the ballot front (straight ticket votes and four state board races – see below). Eventually photographing the ballot backs from the 2008 election was dropped. For that election, the only audit value in taking photo sets of backs was as a check on ballot totals.

For the 2012 primary there was an additional complication. In Michigan primaries, the voter can legally vote in only one partisan primary (e.g. Republican or Democratic). In Allegan County partisan sections for each party appeared on both the front and the back of the ballot. So, predictably, some voters mistakenly voted at least once in each primary (called "crossover"

voting).[4] Some of the sampled precincts had crossover voted ballots.[5]

Photographing ballot backs was important for the 2012 primary audit because some crossover ballots were voted for one party on one side and the other party on the other. In order to detect this situation so the partisan sections could be properly discounted, there needed to be a way that a photo of a ballot back could be associated with the photo of the front of the same ballot. This was resolved by always shooting a whole ballot (front, then back) before going on to the next ballot.[6]

One last matter of photography concerned how to identify photos so that the same ballot would not be counted twice and every ballot would be counted once. Digital cameras provide a ready solution. Each photo is given a number when taken. That number can be used to identify the ballot since it is retained in the file name when the digital photo is saved. For each precinct it was necessary to remove the first photo when a second shot had been taken. With magnification if necessary, duplicates are easy to spot. Even a duplicate of a ballot voted with a single straight ticket mark and nothing else can be spotted with certainty under magnification, because no two marks are exactly the same. To save time in sorting out extra shots a simple card with "duplicate" inscribed can be set next to a ballot when retaking the shot. This procedure was used by the MERA volunteers who photographed 2012 primary sets.

Photos of spoiled ballots also needed to be removed. Spoiled ballots, when properly labeled at the precinct, have the word "spoiled" written at the top. So they can be identified easily from the photo image.

Counting by Hand

Initial, exploratory hand counts were carried out to determine the best feasible method. It was found that when a single person or two people working together counted using a simple read and tally method, errors were common. Repeated simple counts produced different totals in the same races much of the time, irrespective of who did the counting. The received methods of hand counting that are used in elections in most European countries and some U.S. states (e.g. New Hampshire)[7] are much more accurate but require teams of four people to dedicate significant blocks of time to count large precincts. The audit did not have sufficient volunteer resources to use these methods.

To address the issue of the accuracy of hand counting, an approach was adopted of recording counted votes on a spreadsheet (e.g. ".xls" or Excel file) where the ballot is uniquely identified by its photo number. While initial counts by this method still contain errors, the initial counts can be corrected systematically and methodically using the spreadsheet record. Some methods

of error correction are described below.

Choosing Races to Count

In the '08 general election the large two-sided ballot included a straight party ticket section, fifteen partisan races, five non-partisan races, and two ballot proposals. One aim of the audit was to find vote total discrepancies large enough to raise a question of rigged outcomes. If vote totals had been manipulated, it was reasoned, there would be motive to cover it up by changing ballots before the audit so that vote totals matched the official election day report. Such activity, if it occurred, would be likely to focus on high-profile races or the contested judicial race. The ballot sections that would receive the least attention and take the most time to realign were the straight party ticket section and four races for state-wide boards.[8] So, for the '08 election the audit chose to count the straight party ticket section and the four state board races.

The '12 primary, on the other hand, was a low turnout election. The Republican part of the ballot included seven races on the front of the ballot, for U.S. Senate and House, MI Legislature, and four county positions. Three more county races were on the back along with, typically, six local township or city races. Because of the election's low turnout, it was feasible to count more races. One heavily contested four-way race for County Clerk/Register was counted by the audit along with the other six races on the front of the ballot.

Ballot Container Seals and Ballot Security

Michigan law requires that voted ballots be stored in approved and sealed containers on election night and remain sealed until thirty days after the election is certified or after any recount is completed. In the event of a recount, containers are opened under observation and must remain under observation until they are resealed after being recounted. Once an election is certified, the ballots enter the federal retention period, which lasts for 22 months or longer if affected by a court order or Freedom of Information Act request. While federal law requires that ballot sets be stored intact, it does not require the use of container seals during storage.

In spite of the lack of a federal requirement for seals, most of the ballot sets the audit examined (many months after certification) were under seal. Some precincts made a show of the seals, which were duly photographed by the audit. In one case ('08 Otsego Twp. P1), after a show of ballot security, the precinct's sealed set of ballots were found by the audit to be about 200 ballots short of the official total. Then the clerk went in a back room and retrieved about 200

ballots that were not from the sealed set and presented them as voted ballots. Evidently ballot security in this precinct in '08 was less than perfect.

Along with the seal, each ballot container should have a "ballot container certificate" attached that records the seal number with two verifying signatures. Some of the containers photographed showed certificates with three or four seal numbers, indicating that they had been opened and resealed two or three times before being seen by the audit. The attempted recount of the contested judicial race in '08 may account for some containers being resealed at least once. Other resealings could have resulted from the same recount attempt if ballot sets were opened for the recount but not dealt with timely. Otherwise, the audit has not been able to account for multiple resealings, including cases from the '12 primary as well as the '08 general.

The audit did gather photographic evidence on containers and seals in twenty precinct samples from the two elections. Various irregularities were evident. Several precincts from both elections presented ballots stored in canvass bags, which are not state-approved containers.[9] No evidence was visible that the canvass bags had been approved by the County Board of Canvassers, as required. While this may be acceptable during the federal retention period, in one very clear case the container certificate attached showed the canvass bag was sealed on election night and never reopened.[10]

Among approved seals, a plastic "Pull-Tite" seal was used frequently. In many cases, however, the seal was not pulled tight enough and could easily have been removed and reattached. If such occurred, a portion of the "tail" of the seal would be missing, but it would be impossible after the fact to determine if the missing piece just broke off or was the result of tampering.

In most of the cases of containers that had been resealed several times with new seal numbers, the required signatures of witnesses to each resealing were missing.

One precinct in the '12 primary stored ballots in cardboard boxes, sealed with packing tape with red paper seals pasted over the box junctions. Red paper seals are intended only for identifying envelopes with election related materials other than voted ballots for the use of the County Clerk, local Clerk, or Board of Canvassers. Another precinct stored primary absentee ballots in paper envelops with paper seals placed across the edge of the sealed flap. None of these practices are acceptable during the initial (non-federal) retention period.[11]

For only two precincts in the '12 primary was the audit able to confirm that containers and seals were used correctly from election night on: Ganges Twp. and Casco Twp.

Ballot Set Sizes

As explained above, the audit's set of ballot photos must match closely in size the official total of voted ballots for any count from the photos to be meaningful. In some cases, however, local clerks were not able to produce ballots sets whose size matched the reported official number of voted ballots. Egregious mismatches in size occurred in both elections.

In one case 169 ballots had gone missing. For the '08 election, the City of Plainwell, Precinct 1 was able to produce only 1643 ballots out of 1812 officially cast. No explanation was available. Another precinct in '08 was short 9 ballots. Both were excluded from the audit vote counts.

The poll book in one precinct in '08 (Dorr Twp. Precinct 2) claimed only 1365 ballots were tabulated and presented 1366 ballots for audit. However, the tape printed out by the tabulator on election night reported that 1408 ballots were cast. Because of the large discrepancy within the election record (42 ballots), this precinct was also excluded from the audit vote counts.

Of the 12 precincts photographed for the '12 primary, only one, City of Holland Ward 5 Precinct 11, was excluded from the audit vote count. In that precinct the ballots presented to the audit were short by 91 from the official total of ballots cast.

Most cases of discrepant ballot totals, however, were in the range of 1-3 ballots. Of 28 precincts from the '08 general that were considered for the audit, 7 matched exactly in ballot set size and 18 had discrepancies in the range of 1-3 ballots. For the '12 primary, 6 out of 11 counted had exact matches. The others were discrepant by 1-3 ballots.

Counted Precincts

For the '08 general, the audit fully counted 17 precincts: Casco Twp. P1A and P1B, City of Allegan P1, City of Fennville P1, City of Holland Ward 5 P1, Ward 5 P2 and Ward 5 P3, City of Otsego P1, City of Saugatuck P1, Dorr Twp. P1 and P3, Ganges Twp. P1, Gunplain Twp. P1 and P2, Lee Twp. P1 and Otsego Twp. P1 and P2. Ballot total discrepancies for this set ranged from 0 to 3, with 7 exact matches.

For the '12 primary, 11 precincts were fully counted: Allegan Twp. P1 and P2, Casco Twp. P1, City of Allegan P1, City of Douglas P1, City of Fennville P1, City of Otsego P1, City of Plainwell P1, Clyde Twp. P1, Ganges Twp. P1, and Trowbridge Twp. P1. Ballot total discrepancies ranged from 0 to 3, with 6 exact matches.

Cumulative Error Correction

The practice of recording votes on computer spreadsheets provided the audit a relatively efficient and *cumulative* method of error correction. Instead of doing another full hand count that also contains errors, the method of error correction uses a finished initial hand count spreadsheet to search for and correct hand count errors.

Various strategies of searching for hand count errors can be devised based on comparison of initial results with official results. If one assumes as a search procedure that official totals are correct, then one can infer from discrepancies between the initial hand count and the official total where to look for possible hand count errors. For example, when the hand count total for a candidate is larger than the official result, one can search only ballots voted *for* the candidate on the spreadsheet. When the hand count is smaller than the official count, one can search only ballots *not* voted for the candidate according to the hand count. Thus by assuming the tabulator result is correct, one can devise time saving searches to re-examine only relevant ballots.

Such methods of error correction were applied to each initial hand count until all the ballots in the photo set had been reexamined fully at least once, and in some cases two or three times.[12] Errors were found in each set and corrected.

Hand Count Results

Two summary spreadsheets (one for each election) are presented below with the results of the hand counts after cumulative error correction. Due to limitations of space in this printed edition, the same rows of each section are continued on the following page. For easier viewing, it is recommended that the reader download the intact spreadsheet files:

http://www.michiganelectionreformalliance.org/AlleganAudit08Sum.xls

http://www.michiganelectionreformalliance.org/AlleganAudit12Sum.xls

Allegan County	Straight Party							State Board of Education										Regent University of Michigan									
2008 General																											
Precinct	R	D	G	T	L	NL		R1	R2	D1	D2	G	T1	T2	L1	L2		R1	R2	D1	D2	G	T1	T2	L1	L2	
Casco Twp P1A																											
Counted=167 Official=167																											
Hand Count Total	43	42	0	0	1	0		69	68	59	63	1	8	2	7	4		72	67	60	60	2	1	5	4	7	
Official Total	43	42	0	0	1	0	86	69	68	59	63	1	8	2	7	4	281	73	67	59	59	2	1	5	4	7	277
Difference	0	0	0	0	0	0		0	0	0	0	0	0	0	0	0		1	0	-1	-1	0	0	0	0	0	
Error Rate*			0.00%								0.00%										1.08%						
Casco Twp P1B																											
Counted=1292 Official=1293																											
Hand Count Total	290	345	0	0	0	3		497	451	537	566	30	57	24	40	26		533	442	501	545	34	23	30	35	51	
Official Total	290	345	0	0	0	3	638	496	450	539	567	30	57	25	42	27	2233	540	442	497	540	34	23	30	35	51	2192
Difference	0	0	0	0	0	0		-1	-1	2	1	0	0	1	2	1		7	0	-4	-5	0	0	0	0	0	
Error Rate			0.00%								0.40%										0.73%						
City of Allegan P1																											
Counted=731 Official=734																											
Hand Count Total	116	196	1	3	0	0		229	192	336	358	24	49	21	17	12		255	202	299	347	18	20	22	14	29	
Official Total	117	197	1	3	0	0	318	230	193	336	359	25	49	21	17	12	1242	256	203	298	346	19	20	22	14	30	1208
Difference	1	1	0	0	0	0		1	1	0	1	1	0	0	0	0		1	1	-1	-1	1	0	0	0	1	
Error Rate			0.63%								0.32%										0.50%						
City of Fennville P1																											
Counted=449 Official=449																											
Hand Count Total	89	134	NC	NC	NC	NC		165	142	190	217	7	24	10	12	9		167	142	202	211	8	9	8	11	12	
Official Total	89	134	2	1	2	0		165	142	190	217	7	24	10	12	9	776	167	142	202	211	8	9	8	11	12	770
Difference	0	0	na	na	na	na		0	0	0	0	0	0	0	0	0		0	0	0	0	0	0	0	0	0	
Error Rate			na								0.00%										0.00%						
City of Holland W5 P1																											
Counted=531 Official=533																											
Hand Count Total	173	149	0	2	1	0		249	237	185	189	15	27	15	17	13		262	240	174	184	13	12	16	17	22	
Official Total	na	na	na	na	na	na		249	237	186	190	15	27	15	17	13	949	262	241	175	185	13	12	16	17	22	943
Difference								0	0	1	1	0	0	0	0	0		0	1	1	1	0	0	0	0	0	
Error Rate											0.21%										0.32%						

Allegan County 2008 General Precinct	Trustee Michigan State University										Governor Wayne State University									
	R1	R2	D1	D2	G	T1	T2	L1	L2		R1	R2	D1	D2	G	T1	T2	L1	L2	
Casco Twp P1A																				
Counted=167 Official=167																				
Hand Count Total	70	72	59	63	4	4	3	4	5		66	69	60	62	2	2	4	5	7	
Official Total	70	72	59	63	4	4	3	4	5	284	66	69	60	62	2	2	4	5	7	277
Difference	0	0	0	0	0	0	0	0	0		0	0	0	0	0	0	0	0	0	
Error Rate*				0.00%										0.00%						0.27%
Casco Twp P1B																				
Counted=1292 Official=1293																				
Hand Count Total	506	501	521	520	31	29	27	34	29		464	460	511	485	49	35	28	26	51	
Official Total	506	502	521	521	31	28	27	34	28	2198	463	460	512	486	49	35	28	26	50	2109
Difference	0	1	0	1	0	-1	0	0	-1		-1	0	1	1	0	0	0	0	-1	
Error Rate				0.18%										0.19%						0.38%
City of Allegan P1																				
Counted=731 Official=734																				
Hand Count Total	242	231	330	308	19	24	32	17	9		209	221	311	312	36	31	27	18	25	
Official Total	242	232	331	308	20	24	32	17	9	1215	209	221	310	313	36	31	27	18	25	1190
Difference	0	1	1	0	1	0	0	0	0		0	0	-1	1	0	0	0	0	0	
Error Rate				0.25%										0.17%						0.31%
City of Fennville P1																				
Counted=449 Official=449																				
Hand Count Total	172	165	199	190	10	9	8	9	8		141	151	195	198	14	9	12	11	13	
Official Total	172	165	199	189	11	9	8	9	8	770	141	151	195	198	15	9	12	11	14	746
Difference	0	0	0	-1	1	0	0	0	0		0	0	0	0	1	0	0	0	1	
Error Rate				0.26%										0.27%						0.13%
City of Holland W5 P1																				
Counted=531 Official=533																				
Hand Count Total	245	251	180	183	17	13	14	18	18		229	244	173	173	19	11	11	23	18	
Official Total	245	251	182	184	17	13	14	18	18	942	230	246	176	176	19	11	11	23	18	910
Difference	0	0	2	1	0	0	0	0	0		1	2	3	3	0	0	0	0	0	
Error Rate				0.32%										0.99%						0.48%

Allegan County 2008 General	Straight Party							State Board of Education									Regent University of Michigan									
Precinct	R	D	G	T	L	NL		R1	R2	D1	D2	G	T1	T2	L1	L2		R1	R2	D1	D2	G	T1	T2	L1	L2	
City of Holland W5 P2																											
Counted=693 Official=694																											
Hand Count Total	267	78	0	0	3	0		410	387	159	168	20	11	11	17	12		430	384	141	140	17	11	7	16	16	
Official Total	na	na	na	na	na	na		411	388	159	168	20	11	11	17	12	1197	431	386	141	140	17	11	7	16	16	1165
Difference								1	1	0	0	0	0	0	0	0		1	2	0	0	0	0	0	0	0	
Error Rate			na								0.17%										0.26%						
City of Holland W5 P3																											
Counted=751 Official=752																											
Hand Count Total	249	143	0	2	0	0		382	343	233	233	13	24	13	17	10		386	342	213	222	20	13	11	14	20	
Official Total	na	na	na	na	na	na		383	344	233	233	12	23	13	17	10	1268	387	343	213	222	19	12	11	14	20	1241
Difference								1	1	0	0	-1	-1	0	0	0		1	1	0	0	-1	-1	0	0	0	
Error Rate											0.32%										0.32%						
City of Otsego P1																											
Counted=1738 Official=1738																											
Hand Count Total	337	376	4	5	5	1		609	524	714	742	34	110	48	57	43		686	532	648	715	37	55	58	63	48	
Official Total	335	377	4	5	5	1	727	607	522	714	740	34	111	48	58	43	2877	683	530	649	715	38	55	58	64	48	2840
Difference	-2	1	0	0	0	0		-2	-2	0	-2	0	1	0	1	0		-3	-2	1	0	1	0	0	1	0	
Error Rate			0.41%								0.28%										0.28%						
City of Saugatuck P1																											
Counted=643 Official=643																											
Hand Count Total	131	141	0	0	2	0		220	197	280	303	23	23	11	21	18		230	191	263	275	27	14	15	26	19	
Official Total	131	141	0	0	2	0	274	219	197	281	303	23	23	11	21	18	1096	229	191	263	275	27	14	15	26	19	1059
Difference	0	0	0	0	0	0		-1	0	1	0	0	0	0	0	0		-1	0	0	0	0	0	0	0	0	
Error Rate			0.00%								0.18%										0.09%						
Dorr Twp P1																											
Counted=661 Official=662																											
Hand Count Total	194	91	0	1	0	0		363	335	179	185	5	27	24	14	7		343	336	162	182	11	21	20	10	13	
Official Total	194	91	0	1	0	0	286	364	336	179	185	5	27	24	14	7	1141	344	337	162	182	11	21	20	10	13	1100
Difference	0	0	0	0	0	0		1	1	0	0	0	0	0	0	0		1	1	0	0	0	0	0	0	0	
Error Rate			0.00%								0.18%										0.18%						

Allegan County	Trustee Michigan State University										Governor Wayne State University									
2008 General																				
Precinct	R1	R2	D1	D2	G	T1	T2	L1	L2		R1	R2	D1	D2	G	T1	T2	L1	L2	
City of Holland W5 P2																				
Counted=693 Official=694																				
Hand Count Total	418	411	131	139	18	9	9	15	13		396	410	138	129	21	7	9	13	19	
Official Total	418	411	131	139	19	9	9	15	13	1164	395	410	140	129	21	7	9	13	19	1143
Difference	0	0	0	0	1	0	0	0	0		-1	0	2	0	0	0	0	0	0	
Error Rate				0.09%										0.26%						0.20%
City of Holland W5 P3																				
Counted=751 Official=752																				
Hand Count Total	370	381	214	199	23	14	16	11	12		350	364	212	208	19	11	14	19	22	
Official Total	371	383	214	201	22	13	16	11	12	1243	352	364	214	207	18	11	14	20	21	1221
Difference	1	2	0	2	-1	-1	0	0	0		2	0	2	-1	-1	0	0	1	-1	
Error Rate				0.56%										0.66%						0.47%
City of Otsego P1																				
Counted=1738 Official=1738																				
Hand Count Total	608	619	683	680	34	58	49	57	42		550	593	653	656	59	48	65	59	57	
Official Total	608	619	684	680	34	59	49	57	42	2832	549	592	654	660	58	48	65	59	57	2742
Difference	0	0	1	0	0	1	0	0	0		-1	-1	1	4	-1	0	0	0	0	
Error Rate				0.07%										0.29%						0.23%
City of Saugatuck P1																				
Counted=643 Official=643																				
Hand Count Total	209	229	275	261	26	11	10	26	21		197	212	270	258	36	12	9	18	24	
Official Total	208	230	273	261	26	11	10	26	21	1066	196	211	270	257	36	12	9	18	24	1033
Difference	-1	1	-2	0	0	0	0	0	0		-1	-1	0	-1	0	0	0	0	0	
Error Rate				0.38%										0.29%						0.24%
Dorr Twp P1																				
Counted=661 Official=662																				
Hand Count Total	353	356	160	160	13	20	20	14	11		337	355	160	153	13	21	19	15	22	
Official Total	353	357	160	160	13	20	20	14	11	1108	337	355	160	153	13	21	19	15	22	1095
Difference	0	1	0	0	0	0	0	0	0		0	0	0	0	0	0	0	0	0	
Error Rate				0.09%										0.00%						0.11%

Allegan County 2008 General	Straight Party							State Board of Education									Regent University of Michigan								
Precinct	R	D	G	T	L	NL		R1	R2	D1	D2	G	T1	T2	L1	L2		R1	R2	D1	D2	G	T1	T2	L1	L2	
Dorr Twp P3																											
Counted=1130 Official=1130																											
Hand Count Total	308	171	1	1	5	1		555	492	341	360	11	60	21	43	27		572	481	311	324	17	36	35	39	38	
Official Total	308	170	1	1	5	1	486	555	492	341	361	11	60	21	42	27	1910	572	481	311	324	17	36	35	38	38	1852
Difference	0	-1	0	0	0	0		0	0	0	1	0	0	0	-1	0		0	0	0	0	0	0	0	-1	0	
Error Rate			0.21%								0.10%											0.05%					
Ganges Twp P1																											
Counted=1414 Official=1414																											
Hand Count Total	365	319	8	2	1	4		598	533	523	566	39	78	41	50	45		632	525	493	544	45	38	36	45	47	
Official Total	364	319	8	2	1	4	698	595	531	524	568	39	78	41	49	45	2470	631	525	493	545	45	39	36	45	47	2406
Difference	-1	0	0	0	0	0		-3	-2	1	2	0	0	0	-1	0		-1	0	0	1	0	1	0	0	0	
Error Rate			0.14%								0.36%											0.12%					
Gunplain Twp P1																											
Counted=2027 Official=2024																											
Hand Count Total	469	331	3	5	8	1		867	751	705	722	50	99	57	67	43		905	758	621	712	47	44	45	70	78	
Official Total	468	327	3	5	8	1	812	866	750	702	721	50	99	57	66	43	3354	905	757	619	709	47	44	46	70	77	3274
Difference	-1	-4	0	0	0	0		-1	-1	-3	-1	0	0	0	-1	0		0	-1	-2	-3	0	0	0	0	-1	
Error Rate			0.62%								0.21%											0.21%					
Gunplain Twp P2																											
Counted=1207 Official=1204																											
Hand Count Total	231	253	0	4	0	1		450	393	464	471	29	87	52	38	27		466	385	426	458	28	66	48	40	34	
Official Total	233	257	0	4	1	1	496	451	394	461	469	29	87	52	37	28	2008	470	387	425	454	28	66	47	40	34	1951
Difference	2	4	0	0	1	0		1	1	-3	2	0	0	0	-1	1		4	2	-1	-4	0	0	-1	0	0	
Error Rate			1.41%								0.45%											0.62%					

Allegan County	Trustee Michigan State University										Governor Wayne State University									
2008 General																				
Precinct	R1	R2	D1	D2	G	T1	T2	L1	L2		R1	R2	D1	D2	G	T1	T2	L1	L2	
Dorr Twp P3																				
Counted=1130 Official=1130																				
Hand Count Total	545	541	303	314	26	32	34	37	25		495	526	305	297	35	43	34	34	35	
Official Total	545	541	303	315	26	32	34	36	25	1857	494	525	305	297	35	43	34	34	35	1802
Difference	0	0	0	1	0	0	0	-1	0		-1	-1	0	0	0	0	0	0	0	
Error Rate				0.11%										0.11%						0.09%
Ganges Twp P1																				
Counted=1414 Official=1414																				
Hand Count Total	593	598	505	513	50	33	38	44	35		547	567	495	495	57	37	43	34	59	
Official Total	591	597	508	513	50	33	38	44	35	2409	543	567	496	495	57	38	43	34	60	2333
Difference	-2	-1	3	0	0	0	0	0	0		-4	0	1	0	0	1	0	0	1	
Error Rate				0.25%										0.30%						0.26%
Gunplain Twp P1																				
Counted=2027 Official=2024																				
Hand Count Total	845	870	668	637	51	55	49	59	46		761	829	612	635	78	59	53	57	68	
Official Total	843	871	665	635	51	55	50	59	45	3274	759	828	610	633	78	59	53	57	68	3145
Difference	-2	1	-3	-2	0	0	1	0	-1		-2	-1	-2	-2	0	0	0	0	0	
Error Rate				0.31%										0.22%						0.24%
Gunplain Twp P2																				
Counted=1207 Official=1204																				
Hand Count Total	439	437	447	426	38	61	51	28	30		387	434	429	437	43	50	51	28	33	
Official Total	441	438	446	426	38	61	51	28	30	1959	388	436	427	435	43	50	51	28	33	1891
Difference	2	1	-1	0	0	0	0	0	0		1	2	-2	-2	0	0	0	0	0	
Error Rate				0.20%										0.37%						0.41%

Allegan County	Straight Party							State Board of Education									Regent University of Michigan								
2008 General																									
Precinct	R	D	G	T	L	NL		R1	R2	D1	D2	G	T1	T2	L1	L2		R1	R2	D1	D2	G	T1	T2	L1	L2	
Lee Twp P1																											
Counted=1094 Official=1092																											
Hand Count Total	144	323	3	1	0	2		328	289	485	510	34	79	51	33	25		364	293	471	475	36	46	50	47	32	
Official Total	144	323	3	1	0	2		327	289	485	511	34	79	51	33	25	1834	364	293	470	475	36	46	50	47	32	1813
Difference	0	0	0	0	0	0		-1	0	0	1	0	0	0	0	0		0	0	-1	0	0	0	0	0	0	
Error Rate			0.00%								0.05%											0.06%					
Otsego Twp P1																											
Counted=1409 Official=1410																											
Hand Count Total	260	253	7	2	2	2		546	461	512	552	40	95	41	57	35		611	470	465	516	43	51	43	42	40	
Official Total	263	255	7	2	2	2	531	547	462	512	552	40	95	41	57	35	2341	612	471	466	517	43	51	43	42	40	2285
Difference	3	2	0	0	0	0		1	1	0	0	0	0	0	0	0		1	1	1	1	0	0	0	0	0	
Error Rate			0.94%								0.09%											0.18%					
Otsego Twp P2																											
Counted=1310 Official=1310																											
Hand Count Total	244	286	2	5	3	1		462	408	509	547	26	94	41	55	30		518	402	493	508	22	45	44	43	55	
Official Total	241	284	2	5	3	1	536	461	406	509	548	26	94	41	55	30	2170	517	400	492	508	22	45	44	43	55	2126
Difference	-3	-2	0	0	0	0		-1	-2	0	1	0	0	0	0	0		-1	-2	-1	0	0	0	0	0	0	
Error Rate			0.93%								0.18%											0.19%					

Allegan County	Trustee Michigan State University										Governor Wayne State University									
2008 General																				
Precinct	R1	R2	D1	D2	G	T1	T2	L1	L2		R1	R2	D1	D2	G	T1	T2	L1	L2	
Lee Twp																				
Counted=1094 Official=1092																				
Hand Count Total	332	335	473	472	42	50	53	35	28		304	306	482	467	52	42	60	27	45	
Official Total	331	334	473	473	43	50	52	34	27	1817	305	307	481	467	52	42	60	27	45	1786
Difference	-1	-1	0	1	1	0	-1	-1	-1		1	1	-1	0	0	0	0	0	0	
Error Rate				0.39%										0.17%						0.17%
Otsego Twp P1																				
Counted=1409 Official=1410																				
Hand Count Total	544	556	484	484	43	54	44	41	37		485	503	486	490	60	47	47	39	46	
Official Total	545	557	485	485	43	54	44	41	37	2291	487	506	488	492	60	48	46	39	45	2211
Difference	1	1	1	1	0	0	0	0	0		2	3	2	2	0	1	1	0	-1	
Error Rate				0.17%										0.54%						0.25%
Otsego Twp P2																				
Counted=1310 Official=1310																				
Hand Count Total	474	485	494	488	41	50	38	42	32		412	439	478	483	55	63	52	41	58	
Official Total	475	483	493	485	41	50	38	42	32	2139	411	436	478	482	55	63	52	41	58	2076
Difference	1	-2	-1	-3	0	0	0	0	0		-1	-3	0	-1	0	0	0	0	0	
Error Rate				0.33%										0.24%						0.24%

Average Error Rate for All 17 Precincts **0.26%**

Allegan County	U.S. Senate					Cong. Rep. 16th			State Rep. 80th			Prosecuting Att.		
'12 Republican Primary														
Precinct	Hekman	Hoekstra	Durant	Glenn		Hoogendyk	Upton		Brink	Genetski		Anderson		
Allegan Twp P1														
Counted=517 Official=518														
Hand Count Total	39	222	128	31		178	245		129	280		345		
Official Total	39	222	129	31	421	178	247	425	129	280	409	346	346	
Difference	0	0	1	0		0	2		0	0		1		
Error Rate		0.24%				0.47%			0.00%			0.29%		
Allegan Twp P2														
Counted=196 Official=197														
Hand Count Total	14	94	51	9		62	108		49	113		136		
Official Total	14	94	52	9	169	62	109	171	49	114	163	137	137	
Difference	0	0	1	0		0	1		0	1		1		
Error Rate		0.59%				0.58%			0.61%			0.73%		
Casco Twp P1														
Counted=392 Official=392														
Hand Count Total	28	179	68	5		77	208		84	185		218		
Official Total	28	179	68	5	280	77	208	285	84	185	269	218	218	
Difference	0	0	0	0		0	0		0	0		0		
Error Rate		0.00%				0.00%			0.00%			0.00%		
City of Allegan P1														
Counted=166 Official=166														
Hand Count Total	10	66	36	7		53	70		34	81		102		
Official Total	10	65	36	7	118	52	70	122	33	81	114	101	101	
Difference	0	-1	0	0		-1	0		-1	0		-1		
Error Rate		0.85%				0.82%			0.88%			0.99%		

Allegan County	Sheriff		Clerk/Register of Deeds					Treasurer	
'12 Republican Primary									
Precinct	Koops		Wartella	Watts	DeJonge	Foster		Brooks	
Allegan Twp P1									
Counted=517 Official=518									
Hand Count Total	356		60	260	52	45		353	
Official Total	357	357	60	260	51	46	417	354	354
Difference	1		0	0	-1	1		1	
Error Rate	0.28%			0.48%				0.28%	0.29%
Allegan Twp P2									
Counted=196 Official=197									
Hand Count Total	131		27	95	17	23		143	
Official Total	132	132	27	96	17	23	163	144	144
Difference	1		0	1	0	0		1	
Error Rate	0.76%			0.61%				0.69%	0.65%
Casco Twp P1									
Counted=392 Official=392									
Hand Count Total	229		18	155	45	33		221	
Official Total	229	229	18	155	45	33	251	221	221
Difference	0		0	0	0	0		0	
Error Rate	0.00%			0.00%				0.00%	0.00%
City of Allegan P1									
Counted=166 Official=166									
Hand Count Total	106		20	65	15	11		108	
Official Total	106	106	20	65	14	11	110	107	107
Difference	0		0	0	-1	0		-1	
Error Rate	0.00%			0.91%				0.93%	0.77%

Allegan County	U.S. Senate					Cong. Rep. 16th			State Rep. 80th D			Prosecuting Att.		
'12 Republican Primary														
Precinct	Hekman	Hoekstra	Durant	Glenn		Hoogendyk	Upton		Brink	Genetski		Anderson		
City of Douglas P1														
Counted=250 Official=248														
Hand Count Total	5	86	41	9		53	90		43	97		103		
Official Total	5	86	41	9	141	52	91	143	43	97	140	102	102	
Difference	0	0	0	0		-1	1		0	0		-1		
Error Rate		0.00%				1.40%			0.00%			0.98%		
City of Fennville P1														
Counted=108 Official=108														
Hand Count Total	5	36	22	4		23	49		26	47		63		
Official Total	5	36	22	4	67	23	49	72	26	47	73	63	63	
Diference	0	0	0	0		0	0		0	0		0		
Error Rate		0.00%				0.00%			0.00%			0.00%		
City of Otsego P1														
Counted=283 Official=283														
Hand Count Total	22	112	53	10		64	137		70	125		173		
Official Total	22	111	53	10	196	64	136	200	68	124	192	170	170	
Difference	0	-1	0	0		0	-1		-2	-1		-3		
Error Rate		0.51%				0.50%			1.56%			1.76%		
City of Plainwell P1														
Counted=292 Official=289														
Hand Count Total	26	115	72	7		76	146		78	128		177		
Official Total	26	114	72	7	219	76	145	221	76	129	205	176	176	
Difference	0	-1	0	0		0	-1		-2	-1		-1		
Error Rate		0.46%				0.45%			1.46%			0.57%		

Allegan County	Sheriff		Clerk/Register of Deeds					Treasurer	
'12 Republican Primary									
Precinct	Koops		Wartella	Watts	DeJonge	Foster		Brooks	
City of Douglas P1									
Counted=250 Official=248									
Hand Count Total	108		8	55	30	24		105	
Official Total	107	107	8	55	30	24	117	106	106
Difference	-1		0	0	0	0		1	
Error Rate	0.93%			0.00%				0.94%	0.60%
City of Fennville P1									
Counted=108 Official=108									
Hand Count Total	68		5	33	17	12		67	
Official Total	68	68	5	33	17	12	67	67	67
Diference	0		0	0	0	0		0	
Error Rate	0.00%			0.00%				0.00%	0.00%
City of Otsego P1									
Counted=283 Official=283									
Hand Count Total	181		21	121	15	29		172	
Official Total	180	180	21	118	15	29	183	169	169
Difference	-1		0	-3	0	0		-3	
Error Rate	0.56%			1.64%				1.78%	1.18%
City of Plainwell P1									
Counted=292 Official=289									
Hand Count Total	179		24	127	20	26		183	
Official Total	178	178	24	126	20	26	196	183	183
Difference	-1		0	-1	0	0		0	
Error Rate	0.56%			0.51%				0.00%	0.57%

Allegan County	U.S. Senate					Cong. Rep. 16th			State Rep. 80th			Prosecuting Att.		
'12 Republican Primary														
Precinct	Hekman	Hoekstra	Durant	Glenn		Hoogendyk	Upton		Brink	Genetski		Anderson		
Clyde Twp P1														
Counted=187 Official=187														
Hand Count Total	7	73	50	5		49	85		49	87		105		
Official Total	7	72	50	5	134	49	85	134	49	87	136	105	105	
Difference	0	0	0	0		0	0		0	0		0		
Error Rate		0.00%				0.00%			0.00%			0.00%		
Ganges Twp P1														
Counted=462 Official=463														
Hand Count Total	18	206	94	25		112	238		94	250		269		
Official Total	18	206	95	24	343	112	239	351	94	248	342	268	268	
Difference	0	0	1	-1		0	1		0	-2		-1		
Error Rate		0.58%				0.28%			0.58%			0.37%		
Trowbridge Twp P1														
Counted=374 Official=374														
Hand Count Total	22	138	121	17		138	169		105	183		240		
Official Total	22	138	121	17	298	138	169	307	105	182	287	240	240	
Difference	0	0	0	0		0	0		0	-1		0		
Error Rate		0.00%				0.00%			0.35%			0.00%		

Allegan County	Sheriff		Clerk/Register of Deeds					Treasurer	
'12 Republican Primary									
Precinct	Koops		Wartella	Watts	DeJonge	Foster		Brooks	
Clyde Twp P1									
Counted=187 Official=187									
Hand Count Total	108		11	67	34	16		111	
Official Total	108	108	11	67	34	16	128	111	111
Difference	0		0	0	0	0		0	
Error Rate	0.00%			0.00%				0.00%	0.00%
Ganges Twp P1									
Counted=462 Official=463									
Hand Count Total	279		32	170	52	56		273	
Official Total	277	277	32	170	52	56	310	274	274
Difference	-2		0	0	0	0		1	
Error Rate	0.72%			0.00%				0.36%	0.41%
Trowbridge Twp P1									
Counted=374 Official=374									
Hand Count Total	244		52	163	38	43		255	
Official Total	243	243	52	163	38	42	295	255	255
Difference	-1		0	0	0	-1		0	
Error Rate	0.41%			0.34%				0.00%	0.16%
			Average Error Rate of All 11 Precincts						**0.42%**

Because of the use of cumulative error correction, the audit vote totals reported here are virtually free from error. They may still be off slightly due to a missing or an extra ballot or inadequate photography.[13] Otherwise, they are more trustworthy than the tabulator counts and in fact reveal significant error rates, which are calculated on the summary spreadsheets and analyzed below.

Beyond discrepancies in ballot totals, the other main source of error is the tabulators themselves. Human marked ballots inevitably present some idiosyncrasies that automated scanners misread or fail to read. Most of these cases are easily resolved by a human observer. Other machine errors can arise as well. To quantify tabulator error, we now turn to a discussion of error rates that will attempt to discern the extent to which tabulator error and total ballot discrepancies are reflected in the audit results.

The audit vote counts do not show any discrepancies large enough to raise questions of vote tampering. The failures of ballot retention discussed above certainly make it impossible to rule out tampering, but evidence of tampering has not emerged from the audit vote counts.

Error Rates

As a result of getting highly accurate hand counts, we can now calculate error rates that are significant empirical measures (see spreadsheets). The error rate for a race is calculated as the sum of the absolute values[14] of differences in the two totals for each candidate divided by the total official number of votes cast in the race.[15]

For each election, the error rate of the counted races is given below the tallies and the precinct average[16] is in the rightmost column on the spreadsheet. The average of those averages is given at the bottom right.

For the '08 election, the single race error rates ranged from 0 to 1.08%. The average error rates for the precincts ranged from 0.09% to 0.48%. That is, from about one wrongly counted vote for every 1100 votes cast to about one for every 205 votes cast. The overall average for all the precincts counted was 0.26%, or about one for every 385 votes cast.

For the '12 primary, the single race error rates ranged from 0 to 1.78%. Precinct averages ranged from 0.00% to 1.18%. That is, from no errors up to about one in every 84 votes cast. The overall average was 0.42%, or about one in every 235 votes cast. The wider spread between precincts and the higher overall average in the '12 primary than in the '08 general are likely to be a reflection of the low turnout in the primary. The number of votes cast was so low that errors had a potentially larger impact on races.

What effect did discrepancies in ballot totals have on the error rate averages? The table below shows the average error rates for three groups of precincts in each election: precincts with ballot totals that matched the audit set (P_0), precincts with a discrepancy of a single ballot (P_1), and precincts with ballot total discrepancies of 2 or 3 (P_{2+}).

	'08 General	'12 Primary
P_0	0.21%	0.35%
P_1	0.28%	0.45%
P_{2+}	0.32%	0.59%

Clearly discrepancies in ballot totals had an effect on error rates. In the large turnout '08 general election, those effects were minimal. In the small turnout '12 primary, the effects of total ballot discrepancies were more dramatic, as might be expected with very low turnout. Whether the higher P_0 error rate in '12 is significant is unclear.

The P_0 error rate for the '08 general is the most conservative estimate of the tabulator error rate, namely 0.21%. Given the very high turnout in '08 and the absence of ballot total discrepancies, the P_0 rate is also the best estimate of tabulator error. On average about one out of every 500 votes is miscounted by the tabulators.[17] It should be kept in mind, however, that this is an average error rate. Actual error rates for individual races easily can be twice as high or half as high.

These results give reason to question the outcome of races where tabulated results show a margin of victory of 0.20%, or perhaps higher. While machine error is unlikely to be skewed toward a single candidate, the closer the race, the more likely it is that a highly accurate hand count will support a different outcome.

For example, in 2004 a close local race in Muskegon was reported on election night as won by the incumbent 791-786. The margin of victory, 5 votes, represents 0.32% of the votes cast in the race (a bit higher than our P_0 rate of 0.21%). A recount was requested and, in this case, the recount was done manually. After the canvassing board's hand count, the election was reversed, with the challenger winning 804 to 802. The hand count found 39 more votes than the tabulators did, reportedly due to voters having made marks too light for the scanner eyes to read.[18]

The need for manual recounts is especially critical in close local races with small vote totals. Unfortunately, Michigan law does not require a manual recount for local races. Instead, the

frequent practice is to run the ballots through the same tabulators again.[19] The audit results indicate that this practice does not provide a meaningful check on the accuracy of close outcomes.

Sources of Tabulator Error

Paper Jams

Tabulator malfunctions have been widely reported during Michigan elections.[20] Most of these malfunctions are in the form of jams where the machine stops counting. This can lead to uncertainty whether the last ballot processed was counted and can throw off vote counts if the answer is not determined accurately.[21] If the tabulator's counter was not observed directly immediately before and after the jam, then an election worker must consult the poll book (including as yet unrecorded applications to vote) to determine which number the tabulator should be showing if the voter's ballot was (or wasn't) counted. The fact of the jam and the outcome should be recorded in the poll book.[22]

Absentee ballots frequently jam the tabulators. Absentee ballots have to be folded and placed in a return envelop before being mailed or manually returned to the local clerk. But the folds make it difficult for the ballot to pass down the paper path of the tabulators. Even when absentee ballots don't jam they are still often rejected by the tabulator. If a ballot fold crosses a designated vote marking area, rejection can result from the tabulator falsely reading the fold as though it was a vote mark and reporting a false over-vote. Because of jams or false over-votes, absentee ballots may have to be duplicated to create a ballot that the tabulator can process. Among those not duplicated, but accepted by the tabulator, there may still be some with a fold in a vote area that results in the tabulator falsely counting a vote where there is none.

So even if the machine doesn't jam and reports no errors, it can still miscount some votes. Beyond paper folds, there are numerous ways that stray marks and human idiosyncrasies in ballot marking can lead to miscounted votes. In most of these situations human observers will regularly interpret a marked ballot differently than the machine. The most common problem in the Allegan elections appears to have been faint marks.

Faint Marks

The audit found two precincts in the '08 election where the straight ticket section of ballots showed an appreciable number of very faint marks. In Gunplain Township Precinct 1 there were 18 faintly marked ballots. In Otsego Township Precinct 2 there were 14 such ballots. Some of these light marks appeared to be made by pencil and may have been missed by the tabulator.[23]

Other faint marks had smudges around the oval to be marked, suggesting that an attempt to erase a mark had been made. While a human reader will readily recognize an attempt to erase a mark, the scanner eye only picks up the residue inside the oval and so counts an erasure remnant as a mark, typically. But it is far from clear that the tabulators in these two precincts found and correctly counted each of the faint, smudged, or erased marks.

Two remedies are readily available for the potential problems raised by very faint ballot marks and erasures. One is to require that ballots be marked with blue or black ink.[24] The other is to be sure that voters are advised not to try to erase marks but encouraged to request a fresh ballot if they make a mistake. (The first ballot is then marked "spoiled," set aside, not tabulated, but noted in the poll book in the final ballot accounting.) Unfortunately, the second remedy may not overcome a problem of voter embarrassment. Many voters are uncomfortable owning mistakes in public.

Idiosyncratic Vote Marks

Other types of idiosyncratic marks and related issues can arise. One voter appeared to be making a game of trying to trace exactly the oval in which a vote is to be marked. This was easily spotted by a human eye, but would be picked up by a tabulator only if the tracing spilled slightly inside the oval. Another voter left a line just under the top of an oval and then went on to fully mark other ovals in the race involved. In Michigan, any mark inside an oval counts as a vote. So the result in this case was probably that the tabulator detected an over-vote for the race and discounted all the attempted votes in that race. This result would be in accord with Michigan rules, but was clearly not in accord with the voter's intent. More obvious cases of this sort arose when a voter marked an "X" over a mistaken vote and initialed it on the side. The intent to take back the vote mark was clear, but Michigan rules are also clear that the mark counts anyway. Strictly speaking these were not cases of tabulator error.

When an absentee ballot shows evidence of voter intent to change a vote, the ballot must be copied and the copy marked according to the voter's intent.[25] People voting in person on election day should have the same recourse. When a stray mark or "X"ed out vote cause the tabulator to falsely report an over-vote and reject the ballot, the voter should be given an opportunity to have the ballot spoiled and vote a fresh ballot.

Over-votes

The audit found seven over-voted ballots across four precincts in the '08 election, and one in the '12 primary. None showed the familiar folds of an absentee ballot. In four of these cases it was clear that the voter did not intend to over-vote because, e.g., a vote was "X"ed out and initialed. None of the three ballots was marked as a duplicate, none was spoiled. Yet the voter should have been given an opportunity to remedy the situation.

When tabulators detect over-votes, they are supposed to reject the ballot and post an error message identifying the problem. If the voter insists on processing the ballot as marked, the tabulator can be overridden by an election worker and the ballot tabulated as marked (but with no votes recorded for the over-voted race). Presumably this was how over-votes turned up in officially cast, non-absentee ballots. Nevertheless, it is possible that a tabulator might have failed to reject an over-vote or to post the right error message so that the over-vote issue was not brought to the voter's attention.[26]

In the four unintentional cases of over-votes, there was no notation in the poll book that indicated the voter had been given an opportunity to redo their ballot but had refused and had had their original ballot processed.[27] So it is quite possible that those voters were not given the same rights at the polling place as are given by rule to absentee voters.[28]

Stray Marks

Stray marks of any sort can be a problem if they reach into an area the tabulators scan. When they appear on absentee ballots, duplication that eliminates the stray marks is required before processing the ballot. The audit found some precincts where ballot fronts showed bleed-through marks regularly (where the back of the ballot was also voted). Almost every precinct examined had some cases of bleed-through marks. Fortunately in these two elections the ballot design did not appear to result in bleed-through marks being counted as attempted votes.

Machine Idiosyncrasies

Each type of tabulator in use has its own idiosyncrasies and technical limitations. While the vendors have not chosen to share this information, it is clear nonetheless that sensor eyes don't see certain colors (e.g. red), and that dust and paper chaff can accumulate in the paper path causing multiple misreads.

The many widely documented security vulnerabilities of currently used tabulators[29] also create opportunities for error, though these would be in the form of deliberate tampering. The audit did not find evidence of tampering in the two elections examined in Allegan Co.

Other Anomalies and Failures of Election Integrity

There were problems with the accounting of write-in votes in both elections. For a write-in vote to be valid in Michigan there must be a name written next to the vote mark. Moreover, the candidate whose name is written in must be preregistered in the relevant jurisdictions. Then if the ballot is marked appropriately and the name, or an acceptable variant, is written in the box next to the vote mark, the vote counts.

To prepare for a review of write-in votes, tabulators are supposed to shunt ballots that contain write-in vote marks to a special bin. These ballots are to be retrieved and examined by poll workers after the polls close. The write-in votes are checked against a list of valid candidates supplied to the precinct and the results are tallied on a page in the poll book, "Write-ins ... Statement of Votes." The tabulators themselves only register the regular vote marks from the line for write-ins. They do not detect whether a name is written in.

The vast majority of write-in vote marks in both elections lacked an accompanying name or had an obviously bogus name written in, e.g. "Mickey Mouse," or "anyone." Thus machine totals other than zero for write-ins were almost always higher than the actual vote total of valid write-ins. Where the audit was able to photograph the precinct poll book, the write-in "statement of votes" generally appeared to be accurate in discounting invalid write-ins.[30] But, particularly in the '08 election, the tabulator tape print out was frequently not corrected. In both elections overstated write-in totals regularly appeared in the county's official report.

In the '08 general election where straight party ticket voting was used, a special problem arose when voters chose to cast an empty or bogus write-in vote. Michigan rules[31] imply that when an invalid write-in vote is discounted, the ballot -- including the section where the write-in was marked – should be counted as though the write-in was never marked. When a straight party ticket vote has been cast, there may be an implied and valid vote for a candidate of the same party in the section where the invalid write-in was discounted. The tabulator would not have recorded these valid votes because of the invalid write-in mark. Cases of this sort occurred in eleven of the seventeen precincts included in the audit. Thus, vote tallies for candidates for state boards were understated by a few votes because a required adjustment to the tabulator print out tape of totals was not recorded or ignored at the county level.[32] Lost votes ranged from 2 per precinct to 28 in the worst case.[33]

One voting pattern that was encountered frequently in the '08 election appeared to reflect a widespread misunderstanding of how votes are counted with straight party ticket voting. A significant percent of voters (about 5%) not only voted straight ticket, but also voted for only one individual candidate in a state board race where there were two open seats. When the candidate was of the same party as the straight ticket vote, the second candidate from that party should also be given a vote because of the straight ticket choice.[34] For example, when a voter marks a straight ticket for the Republican Party and then votes individually for only the second Republican candidate for the State Board of Education, a vote is awarded to the first Republican candidate as well. From the high frequency of such under-voting, one gets the impression that these voters expected their under-vote to be honored. But it wasn't and should not be according to Michigan rules. If it is to continue in force, voter education on the rule is needed.

The audit encountered an especially puzzling anomaly in Lee Township in the '08 election. One voter who was known to the initial auditors (here designated "Voter K") deliberately cast an absentee ballot with an unusual voting pattern. Before the ballot was turned in for processing in the precinct, the voter photographed the ballot and provided the audit with copies of the photos. When the audit counted the precinct and examined the photos taken in the precinct after the election was certified, there was exactly one ballot in the official set (#721) that was voted the same way as Voter K's ballot. But close inspection of the vote marks showed very clearly that the official ballot #721 was not the same ballot. It was voted the same way, but the marks were clearly different marks.[35]

The situation could arise legitimately if Voter K's ballot had to be copied at the precinct before it could be processed. Presumably the absentee ballot had folds when it reached the precinct. So perhaps the tabulator rejected the original ballot and the precinct copied it so the tabulator would take it. However, there is a clear procedure for copying a ballot. In Lee Township the correct procedure was followed for three ballots that were clearly marked "Dup 1," "Dup 2," and "Dup 3." Strangely though, none of the three duplicates acknowledged by the precinct was voted the same way as Voter K's ballot. Ballot #721, which *was* voted the same way, was not marked as a duplicate. Moreover, evidence of folding was clearly visible in the photo of #721, which is not what one should expect if #721 was a duplicate for processing.

To further compound the situation, examination of the '08 Lee Township Poll Book showed a ballot summary from the original "Certificate of Election Inspectors," which had a subtraction error that left 100 supposedly unused ballots unaccounted for. A later correction in red ink purports to resolve the error by changing the number of the last ballot delivered to the precinct to make it appear that the missing 100 ballots were never delivered to the precinct. Though it is possible that this was the case, the audit has no way to verify the correction.

The total combination involving the mysterious disappearance of Voter K's ballot and the seeming disappearance of 100 unvoted ballots could be legitimate. But it certainly looks suspect and raises many questions about what may have been going on in the precinct on election night. One of the easiest ways to rig an election, after all, is to fudge the accounting of unused ballots and use some to "stuff" the ballot box, i.e. vote a number of illegitimate ballots and use them in addition to or instead of ballots that weren't voted in the desired way.[36]

Conclusion

For an electoral system to warrant the confidence of voters, all and only legitimate votes must be counted accurately, and there must be a way that voters can know this is so. It is not enough

for election officials to assert that votes are counted accurately; one hears such claims every time a third-world dictator fixes an election. Instead, there needs to be some way to make vote counting transparent to the public.

The most transparent elections are ones where the vote is hand-counted in public on election night using highly reliable methods.[37] Once electronic vote counting has been adopted instead, the problem of transparency becomes especially urgent, as the fundamental process has now been removed from public view and placed inside the machine – the black box – where no one sees directly what is happening. This audit demonstrates one way to make the business of vote counting public once again.[38]

While the audit has not found discrepancies in the vote count that raise questions of tampering, it has found much evidence of practices and failures that cast doubt on the integrity of the elections and could undermine public confidence in future elections. The list starts with the failures of ballot security that blocked a recount of the close judicial race in '08:

Election Integrity Failings

- Egregious failure to keep ballot containers properly sealed before the election is certified
- Failure to record signatures on ballot container certificates when resealing
- Misuse of container seals
- Resistance to legitimate Freedom of Information Act requests to view and photograph ballots
- Egregious failures to store ballot sets intact after certification but during the Federal Retention Period.
- Inaccurate ballot accounting
- Failure to provide electronic vote counting that is reliable and highly accurate
- Failure to discount invalid write-in votes
- Publishing overstated write-in vote totals
- Failure to adjust vote totals when invalid write-ins are used with straight party ticket voting
- Failure to provide error correction for people voting in person on election day, including insufficient encouragement for voters to have their ballot "spoiled" and replaced
- Allowing voting with pencil; failure to discourage "faint" vote marks
- Failure to post rules on under-votes with straight party ticket voting
- A ballot that disappeared

These failings are serious. They are not merely "administrative shortcomings." Each one raises serious doubt about the integrity of our election practices. Together with the empirical data on the tabulator error rates during the two elections, they raise the very serious question whether the current system of vote counting is adequate or should be replaced. And if it should be replaced, what should replace it -- a more reliable, transparent and accurate technology, or perhaps a return to the time-tested practice of hand counting the vote on election night?

Endnotes

[1] See for example, What Happened in Ohio: A Documentary Record of Theft and Fraud in the 2004 Election by Bob Fitrakis, Steve Rosenfeld, and Harvey Wasserman (Paperback - Oct 20, 2006); Loser Take All: Election Fraud and The Subversion of Democracy, 2000, 2008 by Mark Crispin Miller. IG Publishing, 2008; Deliver the Vote: A History of Election Fraud, An American Political Tradition - 1742-2004 by Tracy Campbell. Avalon Publishing Group, 2005; and Witness to a Crime: a Citizens' Audit of an American Election, Richard Hayes Phillip. Canterbury Press, 2008. Additional references on a broad range of election integrity issues may be found at: http://michignelectionreformalliance.org/resources .

[2] "Facing Michigan's Election Cliff: Addressing the Steep Costs of Failing Vote Tabulators," Michigan Election Reform Alliance.Org. January, 2014.
http://www.michiganelectionreformalliance.org/ElectionCliff.pdf

[3] Michigan Attorney General Opinion #7247.
http://www.ag.state.mi.us/opinion/datafiles/2010s/op10324.htm

[4] Some jurisdictions in other counties have avoided the situation where the voter mistakenly votes in both primaries by preparing separate partisan ballots and supplying voters with only the one they request. In any case, under Michigan law the partisan sections of crossover ballots should not be counted.

[5] Most likely the ballots with crossover votes were from absentee voters. Normally the tabulator will reject ballots with crossover votes. Then the voter should be given an opportunity to have their first incorrectly voted ballot "spoiled" and get a fresh ballot to vote correctly. However, absentee voters who mail in their ballots do not have the same opportunity to correct crossover votes.

[6] The audit counted ballots with crossover votes as part of the total set of voted ballots, but discounted all their partisan votes. Some may have had valid non-partisan votes, since there were non-partisan proposals on the ballot.

[7] The two received methods are the "Sort, Stack, Count, Count" method and the "Read, Observe, Tally, Tally" Method. See http://www.electionintegritycoalition.org/hand_counted_paper_ballots.

[8] State Board of Education and governing boards for three state universities – University of Michigan, Michigan State University, and Wayne State University

[9] State approved ballot containers are detailed here: http://www.michigan.gov/sos/0,1607,7-127-1633_11976-185731--,00.html

[10] '08 general, City of Holland Ward 5 P1. The same was probably true of City of Holland Ward 5 P2, but the photographic evidence was incomplete.

[11] Approved seals and their uses are detailed here: http://www.michigan.gov/sos/0,4670,7-127-1633_11976-185889--,00.html and also here: http://www.michigan.gov/sos/0,4670,7-127-1633_11976-251495--,00.html .

[12] The method of error correction has not only saved time in finding and correcting errors, but appears

to be an effective way to focus human attention so that errors are actually perceived and not passed over due to monotony or prior expectation.

[13] In two cases in the '12 primary a discrepancy in ballot totals was the result of audit error – no image in the audit photo (Allegan Twp P2) or no votes visible with the image showing a ballot flipped on edge (Ganges Twp P1). In one other case in the '12 primary a photo was missing but for undetermined reasons (Allegan Twp P1). A few ballot photos in each election posed problems in reading the vote due to blurring, or obstruction of the view by a hand or finger. The audit's own inventory of these problems found a total of 16 votes that might have been misread by the hand count. 15 of these were from four precincts in the '08 general: Casco Twp P1A – 1, Casco Twp P1B – 4, City of Holland Ward 5 P3 – 6, and Gunplain Twp P2 – 4. One possibly misread vote was from Allegan Twp P2 in the '12 primary.

[14] 'Absolute value' refers to the number without a plus or minus sign.

[15] The audit hand count summary does not include tallies for write-in votes. Since the list of registered write-in candidates was not made available to the audit, there was no way to fully determine the validity of some write-in votes. In any case, since tallying write-ins is the responsibility of election workers (see below), any errors on write-in totals would be human not machine errors. So, given the audit's interest in gauging *tabulator* error rates, write-in tallies should be excluded.

[16] In the '08 election there were gaps in the official data for straight ticket voting, so that section was not included in any of the precinct averages.

[17] The finding here is consistent with the residual (lost) vote rate of zero to 1% calculated by the Pew Center on the States for 2008. "Election Administration by the Numbers," Pew Center on the States, February 9, 2012, http://www.pewstates.org/research/reports/election-administration-by-the-numbers-85899377331 . MERA has found no other data on Michigan tabulator error rates. Data on Minnesota's tabulator's error rates from the 2006 general election show error rates by race which range from 0.008% to 0.284% with an average over ten races of 0.0768%. See "Report and Analysis of the 2006 Post-Election Audit of Minnesota's Voting Systems," Citizens for Election Integrity Minnesota. Principal authors: Mark Halvorson, Director, Cofounder and Laura Wolff, Observation Project Coordinator. April 4, 2007. http://www.ceimn.org/

[18] "Election turns around when inspectors 'see the light,'" Muskegon Chronicle, September 04, 2004. See also: "ES&S in the News," *ibid.*

[19] Department of State training of county boards of canvassers and clerk's office election personnel encourages manual recounts, but Michigan law leaves the decision to the county board of canvassers.

[20] "Facing Michigan's Election Cliff: Addressing the Steep Costs of Failing Vote Tabulators," Michigan Election Reform Alliance. January, 2014.

[21] Under Michigan rules, if the total number of ballots tabulated after the polls close on election night does not match the poll book record and the discrepancy can not be accounted for and recorded in the poll book, then all the voted ballots must be re-tabulated. This may correct some errors.
The audit found over-voted ballots in some precincts. It is not clear whether these were a) initially rejected by the tabulator which was then overridden by an election worker, b) accepted by the tabulator with no votes counted for over-voted races, or c) not recognized and miscounted by the tabulator.

[22] Instructions for managing a jammed tabulator during an election can be found here: http://www.ewashtenaw.org/government/clerk_register/elections/2012-election-inspector-training-manual p. 33.

[23] In the 2012 general, election monitors in Gunplain Twp. observed voters using pencils to mark ballots. The issue was raised with the Clerk of the jurisdiction and the problem corrected during the day. Evidently it was not corrected in '08.

[24] After the '12 general election it was found that the Michigan Legislature had passed a bill during the previous Summer requiring that ballots be marked in blue or black ink (as the standard ballot instructions state), but the new law was not properly recorded until after the '12 general was over.

[25] *Election Officials' Accreditation Study Guide.* Michigan Department of State, Bureau of Elections. 2013. P.128 f.
http://www.michigan.gov/documents/sos/June_2011_Clerk_Accredi_Manual_Complete_362766_7.pdf

[26] It is also possible that the tabulator returned an error message that was insufficient to allow identification of the source of the error. The error messages issued by the AccuVote tabulators (Release 1.96.6) in use in Allegan are listed and explained here:
http://www.ewashtenaw.org/government/clerk_register/elections/2012-election-inspector-training-manual p.36. Since the election worker may not look at the voter's voted ballot, and the error messages are rather vague, the voter alone may or may not be able to discern the source of their ballot's rejection.

[27] In the precinct from the '12 primary, the poll book did note numerous cases of ballots being spoiled and replaced, and one case where the original ballot was spoiled but the voter refused to vote a fresh ballot. The '08 precincts involved were Casco Twp. P1, City of Holland Ward 5 P1, and Gunplain Twp P1. The '12 precinct was Allegan Twp. P1.

[28] The audit was not able to separate absentee ballots to fully resolve the questions here involved. By law in Michigan, jurisdictions below 10,000 voters are not allowed to use an AV Count Board and cannot separate AV from in-person ballots. Of the jurisdictions with precincts included in the audit, the only one to use an AV Count Board was the City of Holland in the '08 general.

[29] For example, *The Machinery of Democracy: Protecting Elections in an Electronic World.* Brennan Center Task Force on Voting System Security, Lawrence Norden, Chair. Copyright 2006: The Brennan Center for Justice at the NYU School of Law.
http://www.michiganelectionreformalliance.org/Brennan_Center_Report.Machinery_of_Democracy.pdf

[30] In the '12 primary, the write-in page was left blank in the City of Plainwell P1 poll book.

[31] R 168.784 Michigan Compiled Rules.
http://www7.dleg.state.mi.us/orr/Files%5CAdminCode%5C941_2009-068ST_AdminCode.pdf
The interpretation here is supported by the *Election Officials' Accreditation Study Guide*, Michigan Department of State, Bureau of Elections. 2013. P. 128 f.
http://www.michigan.gov/documents/sos/June_2011_Clerk_Accredi_Manual_Complete_362766_7.pdf

[32] The chair of one precinct, Ganges Twp. P1, was aware of the adjustment requirement with straight ticket voting. Ganges reported numerous adjustments on the write-in page for local races. Invalid write-ins were discounted and where there was a candidate of the same party as a straight ticket vote, a vote was awarded to the regular candidate. Ironically, the chair forgot to check for the same situation in state board races and failed to award votes for two candidates in one race (with two open seats).

[33] Votes lost due to this adjustment failure were not recorded in the audit totals, since the aim was to measure tabulator error and these errors were human ones. The precincts involved and the number of lost votes in '08 due to failure to adjust for false over-votes were as follows:

Precinct	*Lost Votes*
Casco Twp. 1B	2
City of Allegan P1	7
City of Holland Ward 5 P1	12
City of Holland Ward 5 P3	13
City of Saugatuck P1	8
Dorr Twp. P3	9
Ganges Twp. P1	2
Gunplain Twp. P1	2
Gunplain Twp. P2	6
Lee Twp. P1	28
Otsego Twp. P2	9

[34] R 168.733 Michigan Compiled Rules. P. 3 f., esp. example #21 on p. 13. http://www7.dleg.state.mi.us/orr/Files%5CAdminCode%5C941_2009-068ST_AdminCode.pdf

[35] It's fair to ask here whether the audit photography may have missed a ballot or two from Lee Township in '08. There was a discrepancy regarding the total number of ballots, but, in this case, the audit had two more photos than the official total number of ballots. So, the audit appears to have photographed too many ballots, not too few.

[36] This method was widely alleged by candidates and credentialed election challengers to have been used to fix the Detroit mayoral primary in August, 2014.

[37] http://www.electionintegritycoalition.org/hand_counted_paper_ballots

[38] A fuller approach to bolstering public confidence in accurate elections would involve a risk-based audit before the election is certified that has the authority to escalate investigations and force recounts. See, e.g., "Post-Election Audits of Election Results," Michigan Election Reform Alliance, August, 2008. http://www.michiganelectionreformalliance.org/MI_Post-Election_Audit_Bill_081508.pdf